

Table 9.1

Categorical Concurrence Between Standards and Assessment as Rated by Two Reviewers
Maine SAT Mathematics Reclustered
Number of Assessment Items - 54

Standards			Level by Objective			Hits		Cat. Concurr.
Title	Goals #	Objs #	Level	# of objs by Level	% w/in std by Level	Mean	S.D.	
1 - Cluster 1. Number and Operations	3	10.5	2 3	7 1	87 12	15	0	YES
2 - Cluster 2. Shape and Size	2	5.5	1 2 3	2 1 2	40 20 40	13.5	0.5	YES
3 - Cluster 3. Mathematical Decision Making	3	10.5	2 3	3 5	37 62	5	1	NO
4 - Cluster 4. Patterns	3	11.5	1 2 3	2 5 3	20 50 30	31.5	4.5	YES
Total	11	38	1 2 3	4 16 11	12 51 35	65	3	

Table 9.2

Depth-of-Knowledge Consistency Between Standards and Assessment as Rated by Two Reviewers

Maine SAT Mathematics Reclustered

Number of Assessment Items - 54

Standards			Hits		Level of Item w.r.t. Standard						DOK Consistency
					% Under		% At		% Above		
Title	Goals #	Objs #	M	S.D.	M	S.D.	M	S.D.	M	S.D.	
1 - Cluster 1. Number and Operations	3	10.5	15	0	43	44	51	41	6	16	YES
2 - Cluster 2. Shape and Size	2	5.5	13.5	0.5	40	46	31	44	29	45	YES
3 - Cluster 3. Mathematical Decision Making	3	10.5	5	1	100	0	0	0	0	0	NO
4 - Cluster 4. Patterns	3	11.5	31.5	4.5	54	44	37	43	10	26	WEAK
Total	11	38	65	3	57	45	32	42	10	28	

Table 9.3

Range-of-Knowledge Correspondence and Balance of Representation Between Standards and Assessment as Rated by Two Reviewers
Maine SAT Mathematics Reclustered
Number of Assessment Items - 54

Standards			Hits		Range of Objectives				Rng. of Know.	Balance Index				Bal. of Represent.
					# Objs Hit		% of Total			% Hits in Std/Ttl Hits		Index		
Title	Goals #	Objs #	Mean	S.D.	Mean	S.D.	Mean	S.D.		Mean	S.D.	Mean	S.D.	
1 - Cluster 1. Number and Operations	3	10.5	15	0	4.5	0.5	43	3	WEAK	23	1	0.72	0.05	YES
2 - Cluster 2. Shape and Size	2	5.5	13.5	0.5	3.5	0.5	63	3	YES	21	2	0.51	0.03	NO
3 - Cluster 3. Mathematical Decision Making	3	10.5	5	1	3.5	0.5	33	3	NO	8	2	0.79	0.04	YES
4 - Cluster 4. Patterns	3	11.5	31.5	4.5	7.5	0.5	65	2	YES	48	5	0.69	0.07	WEAK
Total	11	38	65	3	4.75	1.71	51	14		25	15	0.68	0.11	

Table 9.4

*Summary of Attainment of Acceptable Alignment Level on Four Content Focus Criteria
as Rated by Two Reviewers
Maine SAT Mathematics Reclustered
Number of Assessment Items - 54*

Standards	Alignment Criteria			
	Categorical Concurrence	Depth-of- Knowledge Consistency	Range of Knowledge	Balance of Representation
1 - Cluster 1. Number and Operations	YES	YES	WEAK	YES
2 - Cluster 2. Shape and Size	YES	YES	YES	NO
3 - Cluster 3. Mathematical Decision Making	NO	NO	NO	YES
4 - Cluster 4. Patterns	YES	WEAK	YES	WEAK

Table 9.5
Source-of-Challenge Issues by Reviewer
Maine SAT Mathematics Reclustered

Item Number	Comments by Reviewer
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Table 9.6
Depth-of-Knowledge Levels by Item and Reviewers
Intraclass Correlation
Maine SAT Mathematics Reclustered

Item	Rater 1	Rater 2
1	1	2
2	2	2
3	1	2
4	2	2
5	2	2
6	1	2
7	2	2
8	2	2
9	2	2
10	2	2
11	2	2
12	2	2
13	2	2
14	2	2
15	2	2
16	2	2
17	2	2
18	3	2
19	1	1
20	2	2
21	2	2
22	1	1
23	2	2
24	2	2
25	2	2
26	2	2
27	1	2
28	2	2
29	2	2
30	1	1
31	2	2
32	2	2
33	3	3
34	1	2
35	2	2
36	2	2
37	3	2
38	2	2
39	1	2
40	1	1

Table 9.6
Depth-of-Knowledge Levels by Item and Reviewers
Intraclass Correlation
Maine SAT Mathematics Reclustered

Item	Rater 1	Rater 2
41	2	2
42	1	2
43	1	2
44	2	2
45	2	2
46	2	2
47	2	2
48	2	2
49	1	2
50	2	2
51	2	2
52	2	2
53	3	3
54	2	2

Intraclass Correlation: 0.6919

Pairwise Comparison: 0.7963

Table 9.7
Notes by Reviewer
Maine SAT Mathematics Reclustered

Item Number	Comments by Reviewer
6	I coded G because it is a function item, not just a graphing item.
7	general H because it doesn't deal with problem situations or different representations
8	again, I coded general standards here because all the algebra and relations objectives deal with real-life contexts
9	I'm coding items to the generic B if they are numerical calculation questions (with no estimation or verification) or if they are story problems with only numbers and no algebra involved.
14	You can have a gridded response item that allows for thousands of correct solutions? Whoa.
18	Only by working through this can it be seen to be a DOK 2. Interestingly- by changing the greater than to a less than and changing the central minus to a plus, it becomes a level 3.
21	Item 5.3 requires reasoning, but there is only one logical solution. Therefore, I have used J rather than J.1.
26	Almost an I item, but it doesn't really use counting principles.
29	I said G2 because even if this doesn't require a formula it still requires thinking as though you were using variables.
34	same as my note on #6
38	Asks students to derive a formula. Also could be coded to H.4
38	G2 and H4 are pretty similar.
39	Item 1 Part 1 requires more than one step, but at the high school level this is not very complex for the students.
41	Item 8.3 requires interpreting a table and concept of mean. G.1 is partly a match. C was selected because there is no objective related to average or means.
44	pythagorean formula
45	Maine standards have at least four objectives that relate to graphs. Items 8.7 asks students to identify a graph that represents a situtaion. G.1 seems to be the best fit.
46	general H because this requires intuition about manipulating algebraic expressions, but with no contexts associated
48	Items 8.10 is a combination problem. Not included in the Maine standards.
48	General I, because it's a counting problem.
49	8.11 asks students to find a probability, but not of a compound event. Therefore coded item to the generic objective D.
49	not D1, because it's not a compound event
50	8.12 requires knowledge of exponents. Exponents are not noted in the Maine standards. Therefore, I put this item under the generic computation standard B.
51	8.13 requires use of proportions. Proportions are not given in the Maine standards.
51	tough to code

Table 9.7

Notes by Reviewer

Maine SAT Mathematics Reclustered

Item Number	Comments by Reviewer
52	8.14 requires computation of a perimeter. E2 is the best fit.

Table 9.8
DOK Levels and Objectives Coded by Each Reviewer
Maine SAT Mathematics Reclustered

Item	DOK 0	PObj 0	S1Ob j0	S2Ob j0	DOK 1	PObj 1	S1Ob j1	S2Ob j1
1	1	H.3.			2	H.3.		
2	2	E.2.	B.1.		2	E.2.		
3	1	H.4.			2	H.2.	H.4.	
4	2	A.			2	A.		
5	2	E.1.			2	E.1.		
6	1	H.1.			2	H.1.	G.	
7	2	C.	H.3.		2	H.		
8	2	H.3.			2	H.	G.	
9	2	B.1.			2	B.		
10	2	B.1.			2	B.		
11	2	E.2.			2	E.2.		
12	2	B.			2	B.		
13	2	H.3.			2	H.3.		
14	2	H.3.			2	H.1.	H.3.	
15	2	B.			2	H.3.	G.2.	
16	2	E.2.			2	E.2.		
17	2	H.1.	B.		2	H.2.		
18	3	H.3.			2	H.1.		
19	1	A.			1	A.		
20	2	H.3.			2	H.3.		
21	2	J.	C.2.		2	I.3.	J.	
22	1	A.			1	A.		
23	2	I.4.	B.		2	H.1.	B.	
24	2	E.2.			2	E.2.		
25	2	H.1.			2	H.1.		
26	2	E.2.			2	E.		
27	1	H.3.			2	H.3.		
28	2	H.3.			2	H.1.		
29	2	C.			2	G.2.	B.	
30	1	H.4.			1	H.2.		
31	2	E.2.			2	E.2.		
32	2	E.1.			2	A.1.		
33	3	E.2.			3	E.2.		
34	1	H.1.			2	G.	H.1.	
35	2	A.			2	A.		
36	2	H.3.			2	H.3.		
37	3	H.4.	G.1.		2	J.		

Table 9.8
DOK Levels and Objectives Coded by Each Reviewer
Maine SAT Mathematics Reclustered

Item	DOK 0	PObj 0	S1Obj j0	S2Obj j0	DOK 1	PObj 1	S1Obj j1	S2Obj j1
38	2	H.3.			2	G.2.	H.4.	
39	1	B.			2	B.		
40	1	E.2.			1	E.2.		
41	2	G.1.	C.		2	H.1.		
42	1	H.3.			2	H.3.	G.2.	
43	1	G.3.			2	H.2.		
44	2	E.2.			2	E.2.		
45	2	G.1.			2	G.1.		
46	2	H.3.			2	H.		
47	2	F.2.			2	G.2.	F.2.	
48	2	B.			2	I.	A.	
49	1	D.			2	D.		
50	2	B.			2	H.3.		
51	2	G.			2	G.		
52	2	E.2.			2	E.2.		
53	3	K.1.	H.3.		3	A.1.		
54	2	E.2.			2	E.2.	J.1.	

Objective Pairwise Comparison: 0.4595

Standard Pairwise Comparison: 0.7619

Table 9.9
Objectives Coded to Each Item by Reviewers
Maine SAT Mathematics Reclustered

Low		Medium		High
2		2.407408		4

1	H.3.	H.3.		
2	B.1.	E.2.	E.2.	
3	H.2.	H.4.	H.4.	
4	A.	A.		
5	E.1.	E.1.		
6	G.	H.1.	H.1.	
7	C.	H.	H.3.	
8	G.	H.	H.3.	
9	B.	B.1.		
10	B.	B.1.		
11	E.2.	E.2.		
12	B.	B.		
13	H.3.	H.3.		
14	H.1.	H.3.	H.3.	
15	B.	G.2.	H.3.	
16	E.2.	E.2.		
17	B.	H.1.	H.2.	
18	H.1.	H.3.		
19	A.	A.		
20	H.3.	H.3.		
21	I.3.	C.2.	J.	J.
22	A.	A.		
23	B.	B.	I.4.	H.1.
24	E.2.	E.2.		
25	H.1.	H.1.		
26	E.	E.2.		
27	H.3.	H.3.		
28	H.1.	H.3.		
29	B.	C.	G.2.	
30	H.2.	H.4.		
31	E.2.	E.2.		
32	A.1.	E.1.		
33	E.2.	E.2.		
34	G.	H.1.	H.1.	
35	A.	A.		
36	H.3.	H.3.		
37	J.	G.1.	H.4.	
38	G.2.	H.3.	H.4.	

Table 9.9
Objectives Coded to Each Item by Reviewers
Maine SAT Mathematics Reclustered

39	B.	B.	
40	E.2.	E.2.	
41	C.	G.1.	H.1.
42	G.2.	H.3.	H.3.
43	G.3.	H.2.	
44	E.2.	E.2.	
45	G.1.	G.1.	
46	H.	H.3.	
47	F.2.	F.2.	G.2.
48	A.	B.	I.
49	D.	D.	
50	B.	H.3.	
51	G.	G.	
52	E.2.	E.2.	
53	A.1.	H.3.	K.1.
54	E.2.	E.2.	J.1.

Table 9.10
Items Coded by Reviewers to Each Objective
Maine SAT Mathematics Reclustered

[illegible]

Number of Reviewers Coding an Item by Objective (Item Number: Number of Reviewers)
Maine SAT Mathematics Reclustered

1											
A.	4:2	19:2	22:2	35:2	48:1						
A.1.	32:1	53:1									
A.2.											
B.	9:1	10:1	12:2	15:1	17:1	23:2	29:1	39:2	48:1	50:1	
B.1.	2:1	9:1	10:1								
B.2.											
I.	48:1										
I.1.											
I.2.											
I.3.	21:1										
I.4.	23:1										
2											
E.	26:1										
E.1.	5:2	32:1									
E.2.	2:2	11:2	16:2	24:2	26:1	31:2	33:2	40:2	44:2	52:2	54:2
E.3.											
F.											
F.1.											
F.2.	47:2										
3											
C.	7:1	29:1	41:1								
C.1.											
C.2.	21:1										
C.3.											
C.4.											
C.5.											
D.	49:2										
D.1.											
D.2.											
J.	21:2	37:1									
J.1.	54:1										
4											
G.	6:1	8:1	34:1	51:2							
G.1.	37:1	41:1	45:2								
G.2.	15:1	29:1	38:1	42:1	47:1						
G.3.	43:1										
G.4.											

Number of Reviewers Coding an Item by Objective (Item Number: Number of Reviewers)
Maine SAT Mathematics Reclustered

H.	7:1	8:1	46:1										
H.1.	6:2	14:1	17:1	18:1	23:1	25:2	28:1	34:2	41:1				
H.2.	3:1	17:1	30:1	43:1									
H.3.	1:2	7:1	8:1	13:2	14:2	15:1	18:1	20:2	27:2	28:1	36:2	38:1	42:2
	46:1	50:1	53:1										
H.4.	3:2	30:1	37:1	38:1									
K.													
K.1.	53:1												
K.2.													

Table 9.12

Number of Reviewers Coding an Objective by Item (Objective: Number of Reviewers)
Maine SAT Mathematics Reclustered

Low		Medium		High
1		1		2

1	H.3.: 2		
2	B.1.: 1	E.2.: 2	
3	H.2.: 1	H.4.: 2	
4	A.:2		
5	E.1.: 2		
6	G.:1	H.1.: 2	
7	C.:1	H.:1	H.3.: 1
8	G.:1	H.:1	H.3.: 1
9	B.:1	B.1.: 1	
10	B.:1	B.1.: 1	
11	E.2.: 2		
12	B.:2		
13	H.3.: 2		
14	H.1.: 1	H.3.: 2	
15	B.:1	G.2.: 1	H.3.: 1
16	E.2.: 2		
17	B.:1	H.1.: 1	H.2.: 1
18	H.1.: 1	H.3.: 1	
19	A.:2		
20	H.3.: 2		
21	I.3.: 1	C.2.: 1	J.:2

Table 9.12

Number of Reviewers Coding an Objective by Item (Objective: Number of Reviewers)
Maine SAT Mathematics Reclustered

22	A.:2		
23	B.:2 1	I.4.: 1	H.1.: 1
24	E.2.: 2		
25	H.1.: 2		
26	E.:1	E.2.: 1	
27	H.3.: 2		
28	H.1.: 1	H.3.: 1	
29	B.:1	C.:1	G.2.: 1
30	H.2.: 1	H.4.: 1	
31	E.2.: 2		
32	A.1.: 1	E.1.: 1	
33	E.2.: 2		
34	G.:1	H.1.: 2	
35	A.:2		
36	H.3.: 2		
37	J.:1	G.1.: 1	H.4.: 1
38	G.2.: 1	H.3.: 1	H.4.: 1
39	B.:2		
40	E.2.: 2		
41	C.:1	G.1.: 1	H.1.: 1
42	G.2.: 1	H.3.: 2	
43	G.3.: 1	H.2.: 1	
44	E.2.: 2		

Table 9.12

Number of Reviewers Coding an Objective by Item (Objective: Number of Reviewers)
Maine SAT Mathematics Reclustered

45	G.1.: 2		
46	H.:1	H.3.: 1	
47	F.2.: 2	G.2.: 1	
48	A.:1	B.:1	L.:1
49	D.:2		
50	B.:1	H.3.: 1	
51	G.:2		
52	E.2.: 2		
53	A.1.: 1	H.3.: 1	K.1.: 1
54	E.2.: 2	J.1.: 1	

Assessment Item DOK vs Consensus DOK (Item Number: Number of Reviewers [Average DOK])
Maine SAT Mathematics Reclustered

1											
[2]:											
A.	4:2[	19:2	22:2	35:2	48:1						
[2]:	2]	[1]	[1]	[2]	[2]						
A.1.	32:1	53:1									
[2]:	[2]	[3]									
A.2.											
[2]:											
B.	9:1[	10:1	12:2	15:1	17:1	23:2	29:1	39:2	48:1	50:1	
[3]:	2]	[2]	[2]	[2]	[2]	[2]	[2]	[1.5]	[2]	[2]	
B.1.	2:1[	9:1[	10:1								
[3]:	2]	2]	[2]								
B.2.											
[2]:											
I.	48:1										
[2]:	[2]										
I.1.											
[2]:											
I.2.											
[2]:											
I.3.	21:1										
[2]:	[2]										
I.4.	23:1										
[2]:	[2]										
2											
[2]:											
E.	26:1										
[3]:	[2]										
E.1.	5:2[	32:1									
[1]:	[2]	[2]									
E.2.	2:2[	11:2	16:2	24:2	26:1	31:2	33:2	40:2	44:2	52:2	54:2
[3]:	[2]	[2]	[2]	[2]	[2]	[2]	[3]	[1]	[2]	[2]	[2]
E.3.											
[3]:											
F.											
[2]:											
F.1.											

Assessment Item DOK vs Consensus DOK (Item Number: Number of Reviewers [Average DOK])
Maine SAT Mathematics Reclustered

[illegible]

Assessment Item DOK vs Consensus DOK (Item Number: Number of Reviewers [Average DOK])
Maine SAT Mathematics Reclustered

[2]:	1.5]	[2]	[2]	[2]	[2]	[2]	[2]	[1.5]	[2]				
H.2.	3:1[	17:1	30:1	43:1									
[3]:	2]	[2]	[1]	[2]									
H.3.	1:2[	7:1[	8:1[	13:2	14:2	15:1	18:1	20:2	27:2	28:1	36:2	38:1	42:2
[2]:	1.5]	2]	2]	[2]	[2]	[2]	[3]	[2]	[1.5]	[2]	[2]	[2]	[1.5]
	46:1	50:1	53:1										
	[2]	[2]	[3]										
H.4.	3:2[	30:1	37:1	38:1									
[2]:	1.5]	[1]	[3]	[2]									
K.													
[2]:													
K.1.	53:1												
[2]:	[3]												
K.2.													
[1]:													

Table 9.14
Group Consensus
Maine Mathematics, Mathematics, Grade 12

Level	Description	DOK
1	Cluster 1. Number and Operations	2
A.	NUMBERS AND SENSE: Students will understand and demonstrate a sense of what numbers mean and how they are used.	2
A.1.	Describe the structure of the real number system and identify its appropriate applications and limitations.	2
A.2.	Explain what complex numbers (real and imaginary) mean and describe some of their many uses.	2
B.	COMPUTATION: Students will understand and demonstrate computation skills.	3
B.1.	Use various techniques to approximate solutions, determine the reasonableness of answers, and justify the results.	3
B.2.	Explain operations with number systems other than base ten.	2
I.	DISCRETE MATHEMATICS: Students will understand and apply concepts in discrete mathematics.	2
I.1.	Use linear programming to find optimal solutions to a system.	2
I.2.	Use networks to find solutions to problems.	2
I.3.	Apply strategies from game theory to problem-solving situations.	2
I.4.	Use matrices as tools to interpret and solve problems.	2
2	Cluster 2. Shape and Size	2
E.	GEOMETRY: Students will understand and apply concepts from geometry.	3
E.1.	Draw coordinate representations of geometric figures and their transformations.	1
E.2.	Use inductive and deductive reasoning to explore and determine the properties of and relationships among geometric figures.	3
E.3.	Apply trigonometry to problem situations involving triangles and periodic phenomena.	3
F.	MEASUREMENT: Students will understand and demonstrate measurement skills.	2
F.1.	Use measurement tools and units appropriately and recognize limitations in the precision of the measurement tools.	1
F.2.	Derive and use formulas for area, surface area, and volume of many types of figures.	2
3	Cluster 3. Mathematical Decision Making	3
C.	DATA ANALYSIS AND STATISTICS: Students will understand and apply concepts of data analysis.	3
C.1.	Determine and evaluate the effect of variables on the results of data collection.	3
C.2.	Predict and draw conclusions from charts, tables, and graphs that summarize data from practical situations.	3
C.3.	Demonstrate an understanding of concepts of standard deviation and correlation and how	2

Table 9.14
Group Consensus
Maine Mathematics, Mathematics, Grade 12

Level	Description	DOK
	they relate to data analysis.	
C.4.	Demonstrate an understanding of the idea of random sampling and recognition of its role in statistical claims and designs for data collection.	2
C.5.	Revise studies to improve their validity (e.g., in terms of better sampling, better controls, or better data analysis techniques).	3
D.	PROBABILITY: Students will understand and apply concepts of probability.	3
D.1.	Find the probability of compound events and make predictions by applying probability theory.	2
D.2.	Create and interpret probability distributions.	3
J.	MATHEMATICAL REASONING: Students will understand and apply concepts of mathematical reasoning.	3
J.1.	Analyze situations where more than one logical conclusion can be drawn from data presented.	3
4	Cluster 4. Patterns	2
G.	PATTERNS, RELATIONS, FUNCTIONS: Students will understand that mathematics is the science of patterns, relationships, and functions.	3
G.1.	Create a graph to represent a real-life situation and draw inferences from it.	3
G.2.	Translate and solve a real-life problem using symbolic language.	3
G.3.	Model phenomena using a variety of functions (linear, quadratic, exponential, trigonometric, etc.).	2
G.4.	Identify a variety of situations explained by the same type of function.	1
H.	ALGEBRA CONCEPTS: Students will understand and apply algebraic concepts.	2
H.1.	Use tables, graphs, and spreadsheets to interpret expressions, equations, and inequalities.	2
H.2.	Investigate concepts of variation by using equations, graphs, and data collection.	3
H.3.	Formulate and solve equations and inequalities.	2
H.4.	Analyze and explain situations using symbolic representations.	2
K.	MATHEMATICAL COMMUNICATION: Students will reflect upon and clarify their understanding of mathematical ideas and relationships.	2
K.1.	Restate, create, and use definitions in mathematics to express understanding, classify figures, and determine the truth of a proposition or argument.	2
K.2.	Read mathematical presentations of topics within the Learning Results with understanding.	1

Table 9.15
Debriefing Summary
Maine SAT Mathematics Reclustered

A. For each standard, did the items cover the most important topics you expected by the standard? If not, what topics were not assessed that should have been?

B. For each standard, did the items cover the most important performance (DOK levels) you expected by the standard? If not, what performance was not assessed?

C. Were the standards written at an appropriate level of specificity and directed towards expectations appropriate for the grade level?

D. What is your general opinion of the alignment between the standards and assessment:

E. Comments

